Homes are High and Dry as the Verde's Floodwaters Surge Below

Full Mitigation Best Practice Story

Yavapai County, Arizona

Cottonwood, AZ – Arizona's Verde River showed its dangerous side by flooding four times during the winter of 2004-2005. But for the most part, the Cottonwood homeowners along Comanche Drive with front-row views of the river escaped serious damage. Under a Yavapai County requirement, homes built in the Verde's floodplain must be elevated at least one foot above the base-flood level. Although the rising water entered some of the lower-level crawlspaces, no flooding was reported in the living areas of these homes.

The recent flooding – the worst since 1993 – proved to be a lesson for those who wondered whether elevating a home was worth the bother and expense. Before the recent severe winter weather, some homeowners had questioned the need for elevation. Elevating homes in the Cottonwood floodplain to meet code requirements may add at least $5,000 to the planning process and $30,000 to the cost of construction.

"The hardest part is convincing people that it's going to flood," said Luke Sefton, vice president of Southwestern Environmental Consultants. Sefton is the owner of an elevated home on Comanche Drive, and has done engineering work on 200 other elevated homes in flood-prone areas. The past season's floods, Sefton added, demonstrated why an elevated house was a wise investment for him as well as others along the Verde River. In the four times the river rose, it did not reach his living space. Sefton, a registered professional engineer and certified floodplain manager, had designed and built his elevated home five years earlier in the Verde Village neighborhood during a dry spell, but he never doubted that floodwaters would one day test his work. "I knew exactly what I was getting into," he said.

Along the Verde River, he said, he helps design homes which, in most cases, can withstand an assault from trees as well as floodwater. The trunks, branches, and other debris carried by a surging river can turn into battering rams, causing massive damage to a structure. Soils in and beneath the house can become saturated, creating enormous pressure. Because of those risks, he prefers to design homes with a solid foundation and thick walls, vented to let the floodwaters flow through the bottom rather than constructing houses on stilt-like piers.

A variety of elevation styles appear along Comanche Drive. The facade of one new home gives the illusion of being only moderately elevated, a few steps up from street level. In fact, the house is built on a lot that descends toward the river. From the rear, the structure rises two-and-a-half feet above base-flood level, well above the minimum required.

From the inside, the elevation is about aesthetics as well as safety. Glass windows and doors open onto a balcony that runs the entire length of the home, offering a sweeping treetop view of the river valley. Beneath the living area of the house is a crawlspace left for the flooding river, with openings in the walls to let water flow harmlessly under the structure.

Prices for this and two other new homes under construction on Comanche Drive range from $245,000 to $290,000, including elevation and other flood-resistant features. Several of those features are mandatory. Yavapai County has regulated construction in the floodplain for more than two decades, with the latest update in the codes completed in 2001.

Besides elevation, county codes require openings in a new structure's exterior walls no higher than a foot from the ground to equalize water pressure inside and outside the structure. Louvered vents over the openings allow floodwaters to flow through the crawlspace but prevent animals from making homes under the house or debris from accumulating.

Among other requirements, homes must be set back from an erosion-hazard area, and foundations must go at least three or more feet below the scour depth of floodwaters. Photos of homes constructed in the floodplain are filed in the county office, so that any later changes violating the rules can be identified. The county's floodplain rules are under review to see whether they need to be fine-tuned even more.

"A new floodplain ordinance is in the works for 2006," said Jeff Low, the county's flood unit manager. He added that in next year's budget, the county will propose to conduct a topographical aerial study of the Verde Valley, which will be used to create vital new floodplain mapping of the area. The county hopes to form a future partnership with the Federal Emergency Management Agency (FEMA) to undertake the project.

“Certainly one of our goals is to restudy our outdated flood studies completed in the 1970s, 1980s and early 1990s,” Low said. “All those studies were done a long time ago. We want to do better and more accurate studies so that we have a better grasp of flood and erosion hazards.”

Meanwhile, residents in the elevated homes on Comanche Drive enjoy the beauty of the valley while having the peace of mind of knowing their houses are built to survive the river’s occasional rampages.

Activity/Project Location

Geographical Area:	**Single County (County-wide)**
FEMA Region:	**Region IX**
State:	**Arizona**
County:	**Yavapai County**

Key Activity/Project Information

Sector:	**Public**
Hazard Type:	**Flooding**
Activity/Project Type:	**Building Codes; Land Use/Planning; Floodplain Management**
Activity/Project Start Date:	**12/2001**
Activity/Project End Date:	**Ongoing**
Funding Source:	**Community Assistance Program (CAP); Community Rating System (CRS); Cooperating Technical Partners (CTP); Flood Mitigation Assistance (FMA); Local Sources; Map Modernization; National Flood Insurance Program (NFIP); State sources**
Funding Recipient:	**Local Government**
Application/Project Number:	**9999**

Activity/Project Economic Analysis

Cost:	**Amount Not Available**

Activity/Project Disaster Information

Mitigation Resulted From Federal Disaster?	**Unknown**
Value Tested By Disaster?	**Yes**
Tested By Federal Disaster #:	**No Federal Disaster specified**
Year First Tested:	**2005**
Repetitive Loss Property?	**No**

Reference URLs

Reference URL 1: **http://www.floodsmart.gov**

Reference URL 2: **http://az.gov/webapp/portal/**

Main Points

- Arizona’s Verde River flooded four times during the winter of 2004-2005. But for the most part, the Cottonwood homeowners along the river escaped serious damage.
- Sefton, a registered professional engineer and certified floodplain manager, designed and built his elevated home in the Verde Village neighborhood during a dry spell, but he never doubted that floodwaters would one day test his work.
- County codes require that homes in the floodplain be elevated at least one foot above the base-flood level.
- County codes require openings in a new structure’s exterior walls no higher than a foot from the ground to equalize water pressure inside and outside the structure. Louvered vents over the openings allow floodwaters to flow through the crawlspace.
- The county’s floodplain rules are under review to determine if they need to be fine-tuned even more.

This house in Cottonwood, is elevated and vented to withstand floodwater.

Luke Sefton, the engineer who helped design this elevated home, points to the level that floodwaters reached during recent floods.